

## Electrical and Electronics Repairers, Commercial and Industrial Equipment

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### What They Do

Electrical and Electronics Repairers maintain, service, and repair a variety of automated assembly line systems as well as production and test equipment. Businesses and other organizations depend on complex electronic equipment for a variety of functions. Some of these units are computer operated, while others may be electromechanical, vacuum, or pneumatic systems that have some electronic controls. Electronics Repairers align, adjust, and calibrate the equipment on a regular basis to keep systems running efficiently. They modify existing, or develop new industrial electronic devices, circuits, and equipment according to company specifications that may not have complete technical data and instructions. When a malfunction does occur, an entire assembly line may stop, and Electronics Repairers must work quickly to locate the problem and repair the system so that production can resume as soon as possible.

Some industrial electronic equipment is self-monitoring and can alert repairers to malfunctions. When equipment breaks down, repairers first check for common causes of trouble, such as loose connections. If routine checks do not locate the trouble, repairers may refer to schematics and manufacturers' specifications to locate problems.

Electronics Repairers sometimes fit older manufacturing equipment with new automated control devices. They replace old electronic control units with programmable logic control (PLC) units. Setting up a new PLC involves connecting it to different sensors and writing a computer program to operate the equipment.

Electronics Repairers calibrate, troubleshoot, maintain, and repair the equipment and instruments that help run tests and locate problems. They use instruments such as oscilloscopes, signal generators, multimeters, pressure gauges and soldering tools to do their work. They keep equipment logs and records of all repairs and services and often keep inventory for spare parts.

### Tasks

- ▶ Perform scheduled preventive maintenance tasks, such as checking, cleaning, and repairing equipment, to detect and prevent problems.
- ▶ Examine work orders and converse with equipment operators to detect equipment problems and to ascertain whether mechanical or human errors contributed to the problems.
- ▶ Set up and test industrial equipment to ensure that it functions properly.
- ▶ Operate equipment to demonstrate proper use and to analyze malfunctions.

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- ▶ Test faulty equipment to diagnose malfunctions, using test equipment and software, and applying knowledge of the functional operation of electronic units and systems.
- ▶ Repair and adjust equipment, machines, and defective components, replacing worn parts such as gaskets and seals in watertight electrical equipment.
- ▶ Calibrate testing instruments and installed or repaired equipment to prescribed specifications.

Detailed descriptions of this occupation may be found in the Occupational Information Network (O\*NET) at [online.onetcenter.org](http://online.onetcenter.org).

### Important Skills, Knowledge, and Abilities

- ▶ Troubleshooting — Determining causes of operating errors and deciding what to do about it.
- ▶ Repairing — Repairing machines or systems using the needed tools.
- ▶ Reading Comprehension — Understanding written sentences and paragraphs in work-related documents.
- ▶ Installation — Installing equipment, machines, wiring, or programs to meet specifications.
- ▶ Mechanical — Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
- ▶ Computers and Electronics — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
- ▶ Problem Sensitivity — The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
- ▶ Near Vision — The ability to see details at close range (within a few feet of the observer).
- ▶ Deductive Reasoning — The ability to apply general rules to specific problems to produce answers that make sense.
- ▶ Oral Comprehension — The ability to listen to and understand information and ideas presented through spoken words and sentences.

### Work Environment

Many Electronics Repairers work on factory floors, where they are subject to noise, dirt, vibration, and heat. Bench technicians work primarily in repair shops, where the surroundings are relatively quiet, and well lit. Electronics Repairers may have to do heavy lifting and require stooping, climbing and maneuvering in hard-to-reach places. They may stand for long periods of time while working on large control panels. Electronics Repairers must follow safety guidelines and often wear protective goggles and hardhats. When working on ladders or elevated equipment, they must wear harnesses to prevent falls. They also must take precautions against electric shock by locking off power to the unit under repair.

Electronics Repairers generally work a 40-hour week. Larger companies may also employ repairers on swing and night shifts. Occasionally, repairers may be on call during their off-duty hours.

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### What's the California Job Outlook?

The California Outlook and Wage table below represents the occupation across all industries.

Standard Occupational Classification	Estimated Number of Workers 2004	Estimated Number of Workers 2014	Average Annual Openings	2006 Wage Range (per hour)
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49-2094	6,800	8,000	270	\$17.89 to \$28.70

*Wages do not reflect self-employment.*

*Average annual openings include new jobs plus net replacements.*

*Source: [www.labormarketinfo.edd.ca.gov](http://www.labormarketinfo.edd.ca.gov), Employment Projections by Occupation and OES Employment & Wages by Occupation, Labor Market Information Division, Employment Development Department.*

### Trends

Overall employment of Electrical and Electronics Repairers is expected to grow at about an average rate for all occupations over the 2004-2014 period. Installation of automated equipment is growing as manufacturers seek new ways to increase production and reduce costs. Companies will install electronic controls, robots, sensors, and other equipment to automate processes such as assembly and testing. Employers will continue to rely on Electrical and Electronics Repairers because any malfunction that idles commercial and industrial equipment is costly.

### Training/Requirements/Apprenticeships

Electrical and Electronics Repairers usually follow one of the following training paths:

- ▶ Community College programs or certificates
- ▶ Regional Occupational Programs
- ▶ Adult Education Programs
- ▶ Vocational school
- ▶ Extensive on-the-job-training

Electrical and Electronics Repairers must understand and apply electronics theory, therefore, formal training in electronics is almost always required. In addition to high school graduation, many employers increasingly expect applicants to have a certificate or associate degree in electronics technology.

Many of California's community colleges offer one-year certificate or two-year degree programs in electronics technology. Training is also available through adult education programs, vocational schools, and regional occupational programs.

Electronics Repairers are certified by trade associations (Refer to Other Sources of Information). Certification is not required but may enhance future employment and promotional opportunities.

### Recommended High School Course Work

High school preparation courses in shop, blue print reading, math, physics, and computer technology are helpful.

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### Where Do I Find the Job?

Direct application to employers remains one of the most effective job search methods.

Use the *Search for Employers by Industry* feature on the *Career Center* page at [www.labormarketinfo.edd.ca.gov](http://www.labormarketinfo.edd.ca.gov) to locate employers in your area. Search using keywords from the following manufacturing industry names to get a list of private firms and their addresses:

- ▶ All Other Industrial Machinery
- ▶ Electric Appliance Merchant Wholesalers
- ▶ Electricity and Signal Testing Instruments
- ▶ Electromedical Apparatus
- ▶ Food Product Machinery
- ▶ Industrial Process Variable Instruments
- ▶ Other Electronic Parts Merchant Wholesalers
- ▶ Other Measuring & Controlling Devices
- ▶ Plastics & Rubber Industry Machinery
- ▶ Printing Machinery & Equipment
- ▶ Search, Detection & Navigation
- ▶ Wiring and Equipment Merchant Wholesalers

Search these **yellow page** headings for listings of private firms or local Contractors:

- ▶ Electric Contractors
- ▶ Electric Contractors-Commercial & Industrial
- ▶ Electric Equipment & Supplies-Manufacturers
- ▶ Electric Equipment Service & Repair
- ▶ Electric Motors-Repairing

### Where Can the Job Lead?

Experienced Electronics Repairers with advanced training may become specialists or troubleshooters who help other repairers diagnose difficult problems. Electronics Repairers with leadership ability may advance to supervisory positions. Those with a bachelor's degree may progress to electronic engineering or management positions. Some experienced repairers may enter self-employment by opening their own repair shops.

### Other Sources of Information

Association of Communications & Electronics Schools International (ACES Int'l)  
[www.acesinternational.org](http://www.acesinternational.org)

International Society of Certified Electronics Technicians  
[www.iscet.org](http://www.iscet.org)

Electronics Technicians Association, International (ETA)  
[www.eta-i.org](http://www.eta-i.org)